

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

SIELCKEN et al

Atty. Ref.: **4662-135**

Serial No. **10/565,773**

Group: **1621**

Filed: **August 17, 2006**

Examiner: **Cutliff**

For: **PROCESS FOR THE CARBONYLATION OF CONJUGATED DIENES USING A
PALLADIUM CATALYST SYSTEM**

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

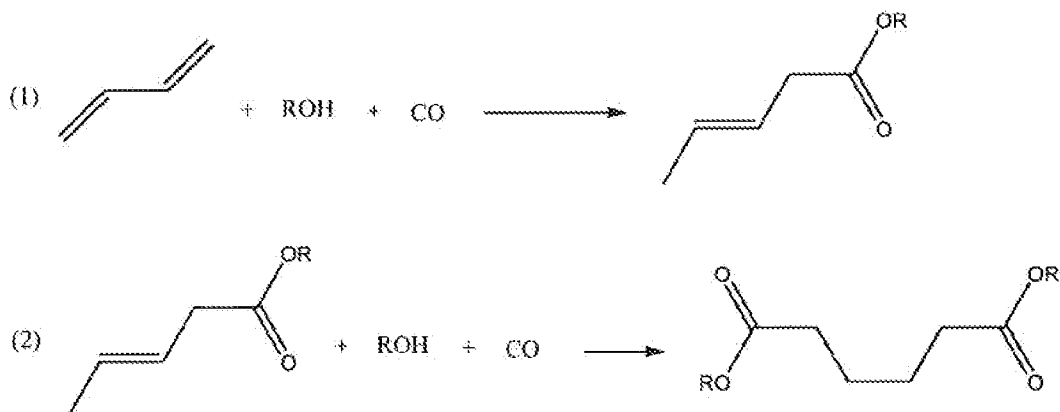
FACTUAL DECLARATION OF OTTO ERIK SIELCKEN

Sir:

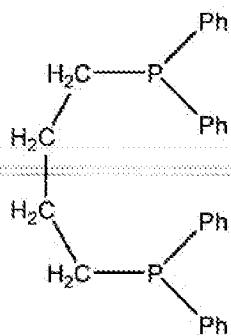
The undersigned, **Otto Erik SIELCKEN** hereby declares and states that:

1. I am presently and for all times relevant to the facts stated herein have been employed by DSM N.V. ("DSM").
2. I am a named coinventor of the invention disclosed and claimed in the above-identified US patent application. I am also a coinventor of US Patent No. 5,495,041 dated February 27, 1996 which on information and belief has been cited as a prior art document during the prosecution of the above-identified US patent application. I therefore am very familiar with the processing technologies for carbonylation of 1,3-butadiene to pentenoate esters.

3. On information and belief, the Examiner has asserted a conclusion to reject the claims pending in the above-identified US patent application that US Patent 5,304,674 ("Drent 2") that, since Drent 2 discloses a "mixture" of ligands in a process for the carbonylation of a 1,3-butadiene, then the presently claimed invention is unpatentably obvious over such reference when combined with US Patent 6,737,542 ("Drent 3") and also taken with WO 02/26690 ("Drent 1") and my earlier issued US '041 patent.
4. One aspect of the invention disclosed and claimed in the above-identified US application is the surprising discovery that a 1,3-butadiene carbonylation process with high selectivity to monoesters can be achieved while yet providing a catalyst system with high stability. Thus, according to the processes of the invention disclosed and claimed in the above-identified US application, the Pd and P inventories in the catalyst system employed may be maintained at very high levels, e.g., 98% or more.
5. Contrary to what the presently claimed invention achieves, the various Drent references, especially Drent 3, aim to convert butadiene into *diesters*, namely adipates, in such a way that the highest selectivity to the *linear* adipate is achieved (with by-products of the Drent processes being branched glutarate and succinate). Drent's results can be expressed in terms of "linearity" which are for convenience of understanding the reaction sequences can be represented by the following reaction schemes:



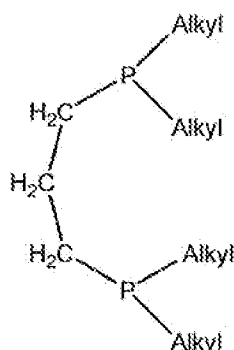
6. It can be seen from Drent 2 that the catalysts with a C4 bridged BDPbut ligand will carbonylate butadiene into the **monoester** (alkenoate ester) with high selectivity. The structure of BDPbut is shown in the following:



BDPbut

7. Substantially no adipate esters (i.e. **diesters**) are formed by Drent 2 at all when only the C4 bridged BDPbut ligand is employed. (See comparative Example A of Drent 2.) Drent's aim of production of adipate cannot therefore be achieved by using BDPbut as sole catalyst.
8. In order to address this issue, Drent therefore employs a second ligand having a C3 bridge and alkyl substituents in order to ensure that the

reaction (see reaction scheme (2) above) proceeds to form the adipate from the monoester. Such C3 bridged ligands are presented by the following formula:



9. The first catalytic species of the Drent references, i.e., the C4 bridged ligand, thus converts butadiene into the monoester, and the second catalytic species, i.e., the C3 bridged ligand, converts the monoester into the adipate. Moreover, while both catalysts (ligands) used in the Drent references have a catalytic function, there is no teaching or suggestion of the combination of ligands having a stabilizing function on palladium.
10. Therefore, while the Drent references indeed disclose that "mixtures" of two catalytic species are present, they are not "mixtures" which achieve an alkylpentenoate reaction product – i.e., a monoester carbonylation product from butadiene – with high selectivity (i.e., a selectivity of 87% and higher). Instead, the aim of the Drent references is to convert butadiene into **diesters**, namely adipates, in such a way that the highest selectivity to the **linear** adipate is achieved.
11. Furthermore, while there are quite a number of Drent patent publications of record in the above-identified US application describing that BDPbut is

a good ligand for catalysis towards monoester formation there is however not one example in any of the Drent patent publications that describes a C_3 ligand with alkyl groups as useful for such reaction.

12. It is therefore my technical conclusion that one of ordinary skill in this art, having knowledge of the Drent references, would not have achieved the invention as disclosed and claimed in the above-identified US application.
13. I hereby declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Respectfully Submitted,

March 19, 2010
Date Signed

Otto E. Sielcken
Otto Erik SIELCKEN